CHAPTER 13

MOTION MEDIA

Motion media has gone through many technical advances in the past several years. Portable motion-video cameras have changed from cumbersome cameras and recording packs to small hand-held cameras. Reduced size, improved quality, and easier operation has, and is continuing to improve and expand motion video in all areas of the Department of Defense. Most Navy ships have closed circuit television systems for information, entertainment, and educational purposes. Motion media is distributed easily and dominates all other sources of communication in today's society. Because of this, the Navy uses this form of communication extensively to relay information.

The most common form of motion-media photography is video. Since the motion picture is the grandfather to the technology of motion media as we know it today, it is discussed briefly in this chapter.

MOTION PICTURE

The first fact regarding motion pictures is they do not move. Each image or frame of motion picture film is a separate, still photograph. These individual images or frames are normally recorded at a rate of 24 separate pictures per second. This rate can be varied to achieve certain effects. Since so little time passes between exposing one frame and the next, there is relatively little difference between pictures, even when the subject moves rapidly.

The illusion of motion in motion-picture photography is due to the natural characteristic of human vision. This characteristic of human vision is called *persistence of vision.* Persistence of vision was discovered by Peter Mark Roget, the author of the famous Thesaurus. The retina of the eye continues to perceive an image for a short period of time after the light stimulus representing the image has been removed. Usually, this "after image" lasts about 1/50 second, depending on the brightness of the image.

In viewing a motion picture, the eye continues to perceive the fading image projected from one frame as it is replaced by the next frame, and so on. In effect, the images are momentarily superimposed in our vision, so any differences between them, however slight, are mentally noted. If these differences suggest any relative change in subject position, the apparent difference is mentally interpreted as motion. The mind translates this information into the logical deduction that whatever we are seeing on the movie screen must be moving.

CAMERAS

Since motion pictures are a series of still pictures, the motion-picture camera is basically the same as the still-picture camera. The primary difference is that it has a mechanism for taking a series of many photographs in rapid succession and at regular intervals on a ribbon of film. All cameras have the following four basic parts: a lighttight compartment, a lens or lenses, a shutter, and a film plane or pressure plate.

The motion-picture camera has two additional basic features; the film drive and intermittent action. The film drive mechanism transports the film continually from a supply spool of unexposed film to a take-up spool of exposed film. This transport takes place by means of toothed, drive sprockets. The teeth of the drive sprockets engage the perforations along the edge of the film and move the film through the camera.

The intermittent action in a motion-picture camera is caused by a pulldown claw that advanced the film one frame at a time at the film gate.

During one cycle of operation of a motion-picture camera, the following action takes place. The film is advanced by the sprocket drive mechanism. The pulldown claw or shuttle then advances the film one frame. The film is stopped momentarily and the shutter revolves once, thereby making the exposure. The pulldown claw then moves the film to the next frame for exposure. Because the film moves in an intermittent or stop-and-go manner, it becomes necessary to have a surplus or loops of film before and after the pulldown claw to help take up the

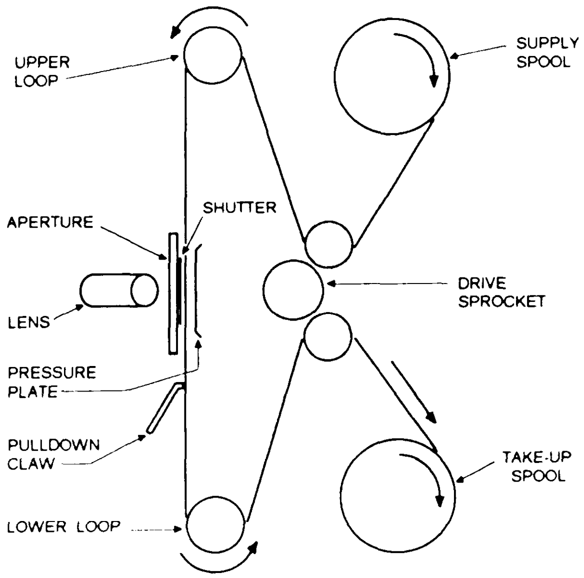

Figure 13-1.–Basic components of a motion-picture camera.

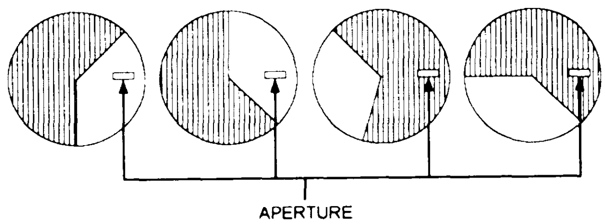

Figure 13-2.–Rotary shutter.

shock and prevent the film from breaking (fig. 13-1).

The shutter in most motion-picture cameras is a focal plane type and is called a rotary disk shutter. A rotary disk shutter is a disk that has a segment cut out, causing the shutter to have a light and dark cycle as it rotates. Exposure is made when the cutout segment of the shutter passes in front of the film. The film is advanced during the dark cycle (fig. 13-2).

A motion-picture camera is used to photograph action in a rapid succession of still pictures on a long strip of film. Each picture area on a motion-picture film is called a frame, and the speed that the camera is operated is called frames per second (fps). The standard operating speed for 16mm cameras is 24 fps. When the camera operating speed and the rate of projection are the same, the action looks normal; therefore, the standard projection speed is also 24 fps. However, it is possible, and sometimes desirable, to make motion pictures at a slower or faster rate than 24 fps. You may do this to either slow down or speed up the action on the screen. To portray a subject in slow motion, you operate the camera at a speed faster than the standard 24 fps, but keep the projector at the standard speed. To portray a subject in fast motion, you operate the camera at a speed slower than 24 fps, and the film is projected at 24 fps. All changes to the portrayal of normal subject motion should be done by adjusting the camera speed, not the movie projector.

Camera speeds in the thousands of frames per second are used in scientific and experimental research to measure and observe such things as the fall of liquids, the speed of objects in flight, and the bursting characteristics of objects. When films shot at very fast fps rates are projected at 24 fps, the illusion of subject motion on the screen is slowed down considerably. At these speeds the viewer can study details of the subject matter and obtain research data.

Motion-picture cameras are classified according to the size (width) of the film they use. The most common motion-picture film sizes are as follows: 8mm, super 8, 16mm, and 35mm. In the Navy today, motion-picture film has almost been completely replaced with video film; however, Hollywood productions still use motion-picture film as large as 70mm.

Lenses used in motion pictures are basically the same as lenses for still photography; therefore, the information on optics presented in chapter 1 also applies to motion-picture camera lenses. The standard or normal focal length lens for a 16mm camera is 1 inch (25mm). Longer or shorter focal length lenses should be considered as long focal length (telephoto) or wide-angle lenses, respectively, depending on what size film is used. A long focal length lens for 16mm film is 38mm or longer. A wide-angle focal length lens for this camera is 13mm-17mm. Table 13-1 illustrates some typical camera and lens combinations.

FILTERS

With one exception, the use of filters for motion pictures is the same as for still photography. The effects that filters produce on motion-picture film emulsions are the same as the effects they produce on still photographic film emulsions. The one exception is the use of a polarizing filter. Camera panning should be avoided because variable darkening of the image results. The information on filters presented in chapter 3 applies to motion-picture photography as well as still photography.

Figure 13-1.–Camera Sizes and Lens F-1 Lengths

	8mm	16mm	35mm
Normal	12mm	25mm	50mm
Wide Angle	6 to 9mm	13 to 17mm	35mm or less
Telephoto	25mm and above	38mm and above	100mm and above

EXPOSURE CALCULATION AND CONTROL

Exposure meters for measuring incident light can be used directly to help determine lighting ratios. A gray card is used to get an accurate exposure reading whenever reflected light meter readings are taken.

Incident light exposure meters are very useful for motion pictures because they can be used at a scene to calculate exposure before the subject arrives. They also can be carried throughout the scene, thereby indicating uneven lighting or "hot spots," thus indicating whether the lighting should be altered.

With a motion-picture camera, the final exposure adjustment is usually made only with the aperture because fps rate of the camera determines the shutter speed. The goal of exposure control for motion pictures is to produce **consistent** and **uniform** image densities and tones from one scene to the next.

Accurate and correct exposure control can be achieved only through the proper use of a good exposure meter. The exposure time for a movie camera is a result of the rate at which the camera is operated (usually 24 fps) and the shutter degree opening (the degree of the open segment of the shutter). The shutter degree opening for a particular camera is provided by the camera manufacturer. Given the shutter degree opening, you can determine exposure time by use of the following formula:

$$\frac{\textit{Shutter Degree Opening}}{360 \ \text{x} \ \textit{fps}} = \textit{Exposure Time in Seconds}$$

For example, suppose you have a camera with a shutter degree opening of 175 degrees and you intend to be filming at the standard rate of 24 fps. Determine the shutter speed as follows:

$$\frac{\textit{Shutter Degree Opening}}{360 \ \text{x} \ \textit{fps}} = \frac{175}{360 \text{ x } 24} = \frac{175}{8640} = \frac{1}{49}$$

or 1/50 second

NOTE: 360 is a constant factor (number of degrees in a circle).

The information on exposure provided in chapter 4 applies equally well to motion-picture photography as it does to still photography.

Neutral density filters (ND) are often used in motion-picture work to help control exposure because of the limited f/stop and shutter speed combinations available on motion-picture cameras. When you are shooting a movie, the fps and the shutter degree opening are fixed. You may not be able to open up the aperture to get the correct exposure control and depth of field; therefore, you would use an ND filter to reduce the amount of light reaching the film. Remember, because of the fps rate, you are restricted to a given shutter speed, and stopping the lens down would destroy your depth-of-field effect.

MOTION VIDEO

Videotape recording has basically replaced motion-picture film making. Motion video has a number of advantages compared to motion-picture coverage. Some of these advantages are as follows:

- A videotape camera can record black and white as well as color.
- No time-consuming film processing is required and recordings can be played back immediately.
- When necessary videotape may be partially or completely erased and used again for several more recordings. It can be played back numerous times and may be stored indefinitely.
- Videotape is edited or assembled more quickly than film.
- Videotapes are duplicated and distributed easily to other Navy activities.

A video camera is optically similar to a movie camera, except it does not use film. Considering the technical complexity of a video camera, it is fundamentally simple. To understand clearly motion video, you must be familiar with some key terms. These terms will be seen commonly in all publications pertaining to video.

KEY TERMS

AGC-Automatic gain control. Regulates the volume of the audio or video light levels automatically within a camcorder.

Analog-An analog signal that fluctuates exactly like the original stimulus (examples, sweep second-hand clock, phonograph player).

Ambient Sound-Background sound or "wild" sound. Sound that surrounds the scene or location, received by the microphone and recorded onto magnetic tape.

Aspect Ratio-The ratio of the height to the width of the film or television frame. Three units high to four units wide (3:4).

Audio Track-The area of a videotape that is used for recording audio information.

Beam Splitter-An optical device within a color camera that splits the white light into three primary colors: red, green, and blue.

Camcorder-A portable video camera with videotape recorder (VTR) and a microphone attached to form a single unit.

Capstan-An electrically driven roller that rotates and transports the videotape past the recorder heads at precise and fixed speeds.

CCD-Charged-coupled device, also called a chip. A small, solid state (silicon resin) imaging device used in a video camera instead of camera pickup tubes. Inside the chip, image sensing elements translate the optical image into a video signal.

Character Generator-An electronic device used to create words or graphics that may be electronically inserted or "keyed" over the video picture.

Color Bars-A color standard used by the television industry for the alignment of cameras and videotape recordings.

Component-The processing of RGB (red, green, blue) channels as three separate channels.

Composite Signal (Y/C)-(Also called NTSC signal) The video signal in which luminance "Y" (black and white) and chrominance (red, green, blue) and sync information are encoded into a single signal.

Control Track-The area of the videotape used for recording the information necessary to synchronize the all elements during playback.

Digital VTR-A videotape recorder that translates and records the analog video signal in digital form.

Dub-Duplication of an electronic recording. Dub is always one generation away from the original recording.

Dropout-A loss of part of the video signal, which appears as white glitches. Caused by dirty VTR heads or poor quality videotape.

Field-Scanning lines in one-half of one video or television frame. There are two fields (one odd and one even) in a frame. One field equals 262.5 scanning lines, which create a total of 525 standard television lines or one frame. Also known as the NTSC signal (U.S. TV system).

Frame-The smallest unit in television or film, a single picture. A complete scanning cycle of the two fields occurs every 1/30 second. A frame equals 525 scan lines.

Gain-The level of amplification for a video or audio signals. Increasing the video gain increases the picture contrast.

Generation-The number of dubs or copies away from the original recording. The greater the number of generations, the greater the loss of picture quality.

Heads-A small assemble within an audio or video recording system, which can erase, record or playback the signal in electromagnetic impulses.

Helical Scan, or Helical VTR-(Also called slant track). A videotape recording or a videotape recorder in which the video signal is put on tape in a slanted, diagonal way. Because the tape wraps around the head drum in a spiral-like configuration, it is called helical.

Noise-Unwanted sounds or electrical interference in a audio or video signal. In the audio track, there is a hiss or humming sound. In the video picture the interference appears as "snow."

NTSC-National Television Standards Committee. U.S. standards for television or video signal broadcasting. Also known as the composite signal (Y/C).

Pickup Tube-The imaging device in a video camera that converts light into electrical energy (video signal).

Pixel-The smallest single picture element with which an image is constructed. The light-sensitive elements in a CCD (chip) camera.

Preroll-To start a videotape and let it roll for a few seconds before it is put in the playback or record mode so that the electronic system has time to stabilize.

RGB-The separate red, green, and blue color (chrominance), or "C," video signals.

Slant Track-Same as helical scan.

Time Base Corrector (TBC)-An electronic accessory to a videotape recorder that helps make playbacks or transfers electronically stable. A TBC helps to maintain picture stability even in dubbing-up operations.

Video Cassette-A plastic container in which a videotape moves from a supply reel to a take-up reel. Used in all but the 1-inch VTRs.

VTR-Videotape recorder or recording. Includes video cassette recorders.

Y/C-The separate processing of the luminance (Y) and chrominance (C) signals.

VIDEOTAPE RECORDERS

Videotaping is similar to audiotape recording. The electronic impulses of television pictures (video signal) and sound (audio signal) are recorded on the videotape by magnetizing the iron oxide coating on the videotape. During playback, the recorded video and audio signals are converted again by the television set into television pictures and sounds. However, the amount of electronic information is many times greater for video than for audio recording.

RECORDING SYSTEMS

There are many different systems of treating and recording the video signals. Videotape recording systems can be divided roughly into three subsections: analog and digital; composite (Y/C), and component; and tape formats.

Analog and Digital Systems

Both analog and digital systems are used in naval imaging facilities. The analog system is easier to understand if you think of it in the same terms as a record and a phonograph. Analog systems record the continually fluctuating video signal that is created and processed by a video source (camera) on videotape. During playback, the recorded information is retrieved as an identical, continually fluctuating signal from the videotape.

Digital-video systems work on the same principle as compact disks (CD) used in your home stereo or office computer. Digital-video systems convert the analog video signals by sampling (selecting parts of) the scanned image. It then translates the scanned image into millions of independent, fixed, values called **pixels.** A pixel is the smallest single picture element from which images are constructed. Each pixel has its own color (hue and saturation) and luminance values. These values are expressed as binary numbers (series of zeros and ones). The binary numbers are then stored on, and retrieved from, videotape or other storage mediums, such as large-capacity disks.

Composite (Y/C) and Component

Composite (Y/C) and component all refer to the way the video signal is treated in the videotape recorder. A composite video signal means that the luminance information ("Y" signal), chrominance information ("C" signal), and the sync information are combined into a single signal (Y+C+sync). Standard television information is designed to operate with composite video signals. Only one wire is required to transport a composite video signal. This composite signal is usually called NTSC, because the electronic specifications for a composite video signal were adopted by the National Television Standards Committee.

The major disadvantage of a composite signal is that slight interference exists between the chrominace and luminance information. This interference becomes more noticeable through each videotape generation.

In a true component system, the R, G, B channels are kept separate and treated as separate red, green, and blue video signals throughout the entire recording process. Each of the three signals remains separate even when laid down on the videotape. The component system requires three wires to transport a video signal. This means that all equipment used in the component system requires three wires to handle the video signal that is incompatible with the NTSC system.

When the video is going to be televised, the signals of the Y/C and component systems must be combined into a single NTSC composite signal before it can be broadcast.

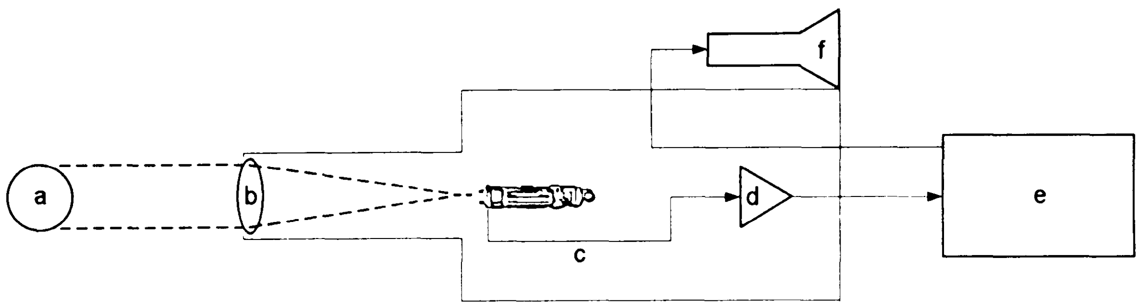

Figure 13-3.–Basic principles of a motion-video camera.

Tape Format Systems

The classification of a videotape recorder VTR by tape width was particularly important in the earlier days when the quality of the videotape recording was directly related to the tape format. The old standard used to be, the wider the tape, the higher the quality of the recording. Anything smaller than the l-inch videotape was considered small format and inferior in quality. Today, 1/2-inch Betacam SP can provide equal or superior quality compared to the large-format, l-inch machines. The Hi8 video camera (8mm) is superior to the 1/2-inch VHS cameras. Today, “small format” is used mainly to describe small, highly portable television equipment, such as small camcorders. Like all state-of-the-art electronic equipment, smaller no longer implies inferior quality.

The quality of the tape itself has much to do with the quality of the picture. No matter how sophisticated the video hardware, the resulting picture is only as good as the videotape being used.

Videotape is a ribbon of polyester film base coated with magnetic iron-oxide particles. The surface of the tape, or emulsion side, that faces the video recorder heads is highly polished to maximize tape-to-head contact and to minimize wear on the heads.

Head clogging results when oxide comes off the tape and gets caught in the head gaps of the recorder. If the tape clogs the video recording heads, you cannot play back or record. Normally, the heads will clog after recording or playing back half a dozen or so tapes. You should have the heads cleaned according to the manufacturer’s recommendations or according to Planned Maintenance System (PMS) requirements.

Videotape dropout occurs when a piece of magnetic oxide or coating on the tape flakes off or is rough, causing a “hole” or line of missing information in the picture when it is viewed on the monitor. Dropout appears on the TV screen as little black or white lines, darting across the picture. The main causes of dropout are dirty heads or imperfections in the tape. Once dropout occurs, it cannot be replaced or corrected on the tape.

There are no black-and-white or color videotapes. Any videotape will record either black and white or color. Black and white or color depends solely on whether the camera and monitor are black and white or color.

THE VIDEO CAMERA

Refer to figure 13-3 to help clarify how a video camera operates. In the video camera, an image (a) is gathered by the camera lens (b), and focused on the face of the camera pickup tube (photocathode) or a solid-state imaging device (c). The face or screen of the photocathode is covered with thousands of light sensitive dots. As light from a particular part of the scene falls on each dot, the dot becomes electrically charged. A charge pattern is built up proportionally to the brightness of the scene. An electron beam in the pickup tube emits a steady beam of electron particles. This electron beam scans the charged pattern on the photocathode and reads over it in a series of lines. The scanning beam neutralizes each picture element or dot and produces varying electrical currents (the video signal). These currents are proportional to the charge pattern which are proportional to the light transmitted through the lens.

The current or video signal (picture) is amplified (d) and then recorded on tape by rotating heads (e) and then converted back to visible screen images in the viewfinder (f).

As each dot on the tube screen is scanned, the dot gives up its information and is wiped clean so the tube screen can respond to any new light it receives.

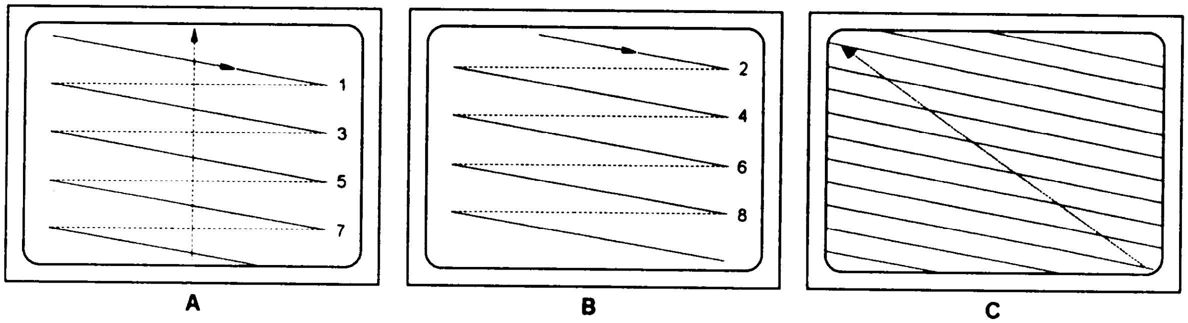

Figure 13-4.–Video scanning.

Figure 13-4 illustrates how this scanning process takes place. The electron beam first scans all odd-numbered lines, from left to right (a). When all odd-numbered lines have been scanned, it makes up a field. One field consists of 262.5 lines. After the odd-numbered ones are scanned, the beam jumps back to the top of the screen. At this point, the beam is so weak that it does not affect the screen. Back at the top of the screen the beam starts scanning the even-numbered lines (b). When all even-numbered lines are scanned a second field is formed. The two fields make up a frame (c) or one complete television picture. A frame consists of 525 lines. After completing a frame, the beam returns to the top to start with another first field.

This charge-forming-and-scanning is a fast, continuous process. The complete camera tube screen (frame) is scanned 30 times per second.

The motion-video camera picks up reflections of light from the scene while the microphone picks up sound. At the same time, the camera changes the light reflections into electrical impulses, and the microphone changes the sound into electrical impulses.

This is basically the way a black-and-white video camera works. A color video camera works on the same principle; however, a color video camera has three tubes. Through the use of a beam splitting device and filters, one tube forms a red image, a second tube forms a green image, and the third tube forms a blue image. The three tubes have identical scanning patterns, so the picture signals they produce are identical, except they differ in color.

During a video recording, the videotape moves past a rotating **head** that "writes" the video and audio signals on the videotape. During playback, the rotating head "reads" the magnetically stored information off the tape Some VTRs use two or four heads for their record/play (write/read) functions. Digital VTRs have even more read/write heads. For explanation purposes a VTR with two record/play heads is discussed in this chapter.

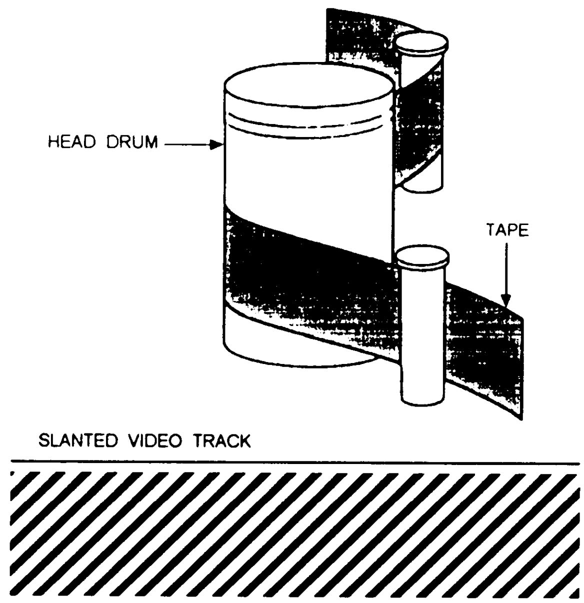

Figure 13-5.–Helical scanning system.

Helical, or Slant-Track, System

The two heads are mounted opposite each other, either on a rapidly spinning head drum or on a bar that spins inside a stationary head drum. When the bar spins inside a stationary head drum, the heads contact the tape through a slot in the head drum. The tape is wound around the head drum in a slanted, spiral-like manner. This permits more tape area to contact the head, allowing the transfer of large amounts of video information (fig. 13-5). If the head contacted only the width of the tape, extreme tape or drum speed would be necessary. Because the Greek word for spiral is helix, this tape wrap, and often the whole video-recording system, is called the helical scan, or slant track

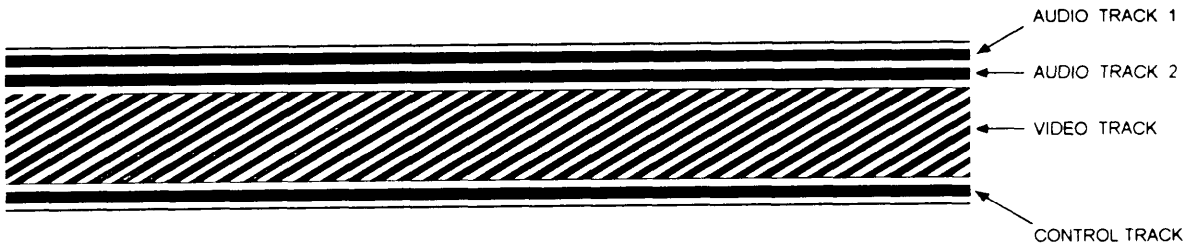

Figure 13-6.–Basic videotape track system.

Most videotape recorders put at least four separate tracks on the tape: the **video track** that contains the picture information, two **audio tracks** that contain all sound information, and a **control track** that controls the videotape and rotation speed of the video heads (fig. 13-6).

VIDEO TRACK.-When video signals are recorded in the normal NTSC composite configuration, one pass of the head records a complete field of video information (Y+C). The next pass of the head, (or, if you have a two-head machine, the second head) lays down the second field right next to it, completing a single video frame. Two fields make up a single frame. The two heads must "'write" sixty tracks (thirty frames) for each second of NTSC video. In the four-head VTR, one pair of heads records at normal tape speed and the other pair records at a slower speed.

AUDIO TRACK.-The audio tracks record the audio signal. They are usually recorded by fixed recording heads that are near the edge of the tape and run along the length of the videotape. Because of the demand for stereo audio and for keeping certain sounds separate even in monophonic sound, all VTR systems provide at least two audio tracks.

CONTROL TRACK.-The control track contains evenly spaced blips or spikes, called the **sync pulse,** that mark each complete television frame. These pulses synchronize the tape speed and the rotation speed of the recording heads. This allows the tape to be played on a similar machine without picture breakups. Because the control track marks each frame of recorded video, it also aids in videotape editing.

Hi8 Track System

Because space is so limited in 8mm videotape, these systems squeeze the automatically generated **time code** and other data between the video and audio portion of a single-slanted track The time code has been developed to provide a precise editing reference by recording the exact frame address onto the tape. The 8mm time code is digitally recorded by units of hour, minute, second, and frame by the video heads. The 8mm time code is used only for 8mm format and is not compatible with other recording formats.

The Hi8 VTR splits each slanted track into audio frequency modulation (AFM) and video information. It also uses a pulse code modulation (PCM) audio track The audio technology used in an Hi8 VTR is superior to video home system (VHS). The video/AFM audio track and the PCM audio track are separated by the time-code data (fig. 13-7).

VIDEO MONITOR

For viewing purposes, you must playback the recording either to the transmitter or directly to a receiver (TV set or monitor). At the receiver, the video and audio signals are separated and processed by separate circuitry. This circuitry changes the video and audio signals back to sound that you can hear and pictures that you can see. The sound is reproduced at the loudspeaker, and the picture is reproduced on the face of the cathode-ray picture tube.

A primary part of the monitor system is the cathode-ray tube. A type of cathode-ray tube is used in

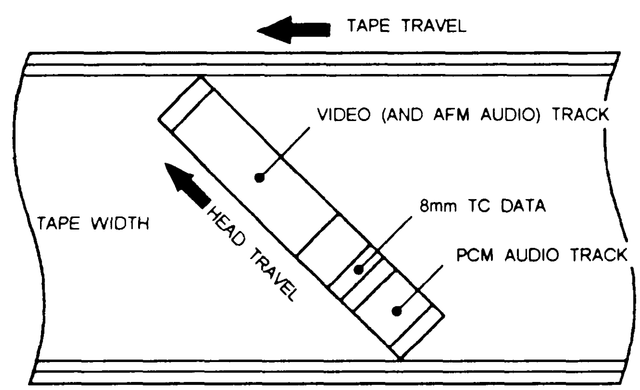

Figure 13-7.–Hi8 VTR tracks.

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Figure 13-8.–Hi8 video camera.

the camera to convert light rays into electrical impulses. The cathode-ray tube converts the electrical impulses back into light in the receiver (monitor).

CAMCORDERS

As a nonspecialized Photographer's Mate without a motion-media NEC 8143, you will be concerned mostly with recording motion-video images using a single camcorder. A camcorder has a single VTR directly attached to the camera to form a camera and recorder unit.

Each camcorder comes with manufacturer's instructions on how to use the equipment. Because there are a great variety of camcorders in the Navy, you must consult the instruction manual supplied with your machine for best results. One common motion-video camera used in the Navy is the Hi8 video camera (fig. 13-8).

The Hi8 camcorder is a small camera-VTR unit that records amazingly high-quality pictures and sound compared to a video home system (VHS) camcorder. It uses a special 8mm (about 1/3 inch) cassette with metal-oxide coated tape. These tapes are similar in size to an audio cassette tape.

A tempting practice while operating a camcorder is to shoot all videotape in the automatic mode. On the Sony Hi8 camcorder, when the AUTO LOCK switch is set, the iris, focus, white balance, sensitivity, and shutter speed (1/60) are set and adjusted automatically. If left unnoticed, there are several circumstances under which the AUTO LOCK mode will produce poor or undesirable results. You, as the camera operator, must pay attention to the subject and the surrounding situations to produce quality motion-video coverage; in particular, brightness levels, focusing, color temperature of the light source, and subject movement.

Brightness Levels

The single greatest influence on picture quality is the brightness level. When the brightness level is too low, the recorded image looks grainy and flat. By familiarizing yourself with the brightness level of the subject, you can improve your recordings tremendously. In situations where the light level exceeds 100,000 lux, such as snow-covered scenes or a beach scene on a clear summer day, an ND filter is required. Under other daylight and bright, indoor conditions, the automatic iris is capable of adjusting to provide excellent results; however, in a low-light situation, such as spaces onboard ship, auxiliary lighting may be required to provide clear, sharp images. Another alternative, when available on your camcorder, is to increase gain. By increasing the gain, you increase the level of amplification of the video signal. This increases the contrast and provides a higher-quality recorded image.

In some situations, such as high-contrast scenes or backlit subjects, you must adjust the iris manually. Just like the aperture on a still camera, when the subject is backlit, open up the iris. When the subject is too bright, you must close down the iris.

Manual Focusing

There are situations when you must manually focus the camcorder to obtain sharp images. In the autofocusing mode, the system uses a sensor at the center of the viewfinder screen to adjust the focus automatically; therefore, in situations where there is insufficient light, the subject is strongly backlit, or with subjects consisting of flat colors or little contrast (such as bulkheads or the sky), the autofocusing mode may not function accurately.

Other situations in which you should use manual focusing are as follows:

- When the subject has finely detailed repetitive patterns
- When one subject is close to the camera and another is far away
- When the subjects are located behind screens, nets, or frosted glass
- When objects pass between the camera and the primary or intended subject

- When using lenses or filters to create special effects

You may also want to use manual focusing to conserve battery power.

CAUTION

NEVER attempt to force or manually focus the focus ring when the camera is set in the autofocusing mode. This may damage the camera.

White Balance

Usually the auto white balance function of a video camera operates sufficiently in the automatic position; however, there are situations when the automatic light balance may not work correctly. Some of these cases are as follows:

- When the light reflecting from the subject is different from the light that is illuminating the camcorder
- When shooting a monochromatic subject or the subject is against a monochromatic background
- When recording under a sodium lamp, mercury lamp, or a white fluorescent lamp
- When recording outdoors under neon lights or fireworks
- When shooting scenes just before sunrise or right after sunset

To white balance a motion-video camera manually, you can follow a simple procedure. Normally a white lens cap, made of a diffuse plastic material, is supplied with the camera. You also can use any white object to white balance the camera, providing the white object is illuminated under the same conditions that you will be shooting. To white balance, you simply place the white lens cap over the lens, point the camera at the light source, and press the white balance button. Remember, when in the manual white-balance mode, if the color temperature of the light changes, you must reset the white balance.

To create special effects, there may be times when you want to "lie" to the white balance sensor; for example, you may want to produce motion video that has a warm color balance, such as that which occurs at sunrise or sunset. To produce video coverage with warm characteristics, you can "white balance" the video camera on a blue object or any of the complimentary colors. When you record the scene, an overall yellow cast is produced. You can also use filters to create various effects.

Shutter Speed

When the Hi8 camera is set in the AUTO LOCK position, the shutter speed is set at the normal speed of 1/60 second. When fast-moving subjects are recorded at the normal shutter speed, the pictures are not recorded clearly. You can improve the image quality by increasing the shutter speed.

Because more light is required when shooting at higher shutter speeds, you should not try to shoot fast objects under poor or low-lighting conditions. Outdoors on clear days, you can record fast-moving subjects at shutter speeds of 1/2000 to 1/10000. On overcast days, shutter speeds of 1/250 to 1/1000 are recommended. While handholding the camera indoors, you may want to provide a more stable image. In this case, a shutter speed of 1/100 is recommended. Do not use a shutter speed of 1/250 or higher indoors unless you use additional artificial lighting.

CAMERA-HANDLING TECHNIQUES

In handling a motion-media camera, two words you must keep in mind are STEADINESS and SMOOTHNESS. When you are shooting motion media, the camera must be held steady, and deliberate camera movements (such as tilts, pans, dollys, zooming, and so on) must be made smoothly. When viewed, the images undergo a high degree of enlargement. Image movement caused by camera unsteadiness is distracting to the audience.

HANDHOLDING THE CAMERA

Very few division officers or chiefs in an imaging facility expect a cameraperson to shoot every scene from a tripod. Tripods cut down on maneuverability. When you are shooting uncontrolled action, "shooting from the hip" is common practice. During a fast-breaking event, it is usually the only way you can get the required coverage. When there is plenty of action in the scene, people do not notice the effects of excessive camera movement by the cameraman.

There are many occasions when freedom of movement and mobility in handholding the camera are essential. You can still produce acceptable motion-video coverage if you use your body as a camera support and shock absorber. When handholding a camera, keep your arms in close to your body and your legs and feet spread about a shoulder width apart. Bend your knees slightly, keeping your weight on the balls of your feet. Lean your body backslightly for better balance. The camera should be over your knees for greatest stability. Hold the camera firmly against your face and place your hand in the camera strap.

Control your breathing while shooting. Each breath you take causes the camera to rise and fall slightly. The technique of taking a deep breath, exhaling a little, and holding the rest while you shoot is an effective way to help eliminate camera unsteadiness. When shooting a long scene, breathe as evenly and slowly as possible.

For added steadiness when handholding a camera, you can lean against something, such as a tree or a wall. Another method for handholding a video camera is to kneel on one leg and rest your elbow on the raised knee. When you must pan the camera, keep your elbow free and pivot your body at the waist.

When handholding a video camera, keep the following facts in mind to reduce the shakiness problem:

- Concentrate on handholding the camera steady while using a wide-angle lens. Your shakiness will be reduced considerably. When using a wide-angle lens, you must get as close to the subject as possible to provide an acceptable image size.

- Shakiness is directly proportional to the focal length of the lens. Slight shakiness may be almost unnoticeable with a wide lens. With a long lens, the same amount of shakiness destroys the entire scene. (See table 13-1.)

- Give yourself a steady platform. Before you squeeze the record button, inhale, then partially exhale. Now, squeeze. Do not pull or jerk the record button. Lean against a building, a tree, or the side of a car. Any support of this nature may provide more steadiness than free standing.

TRIPODS

A tripod can literally be considered the "basis" for most good motion-media products. To help you realize just how important a tripod is for shooting motion media, consider handholding a movie projector. You cannot hold the projector steady for any period of time. The picture weaves around on the screen and is very distracting to the viewers. 'The same result is created when a motion-video camera is handheld, but in this case, images within the picture area appear to weave around because of camera movement. The image you see in the camera viewfinder is so small that you may not notice the camera movement. It is easy to think you are holding the camera steady. Bear in mind that the slightest amount of camera movement is magnified many times when the image is played back

While not all situations permit the use of a tripod, the use of a folded tripod as a unipod is preferable to shooting without camera support. Even the lightest weight, so-called "handheld" video camera produces much better results when supported adequately.

Camera steadiness is only one advantage of using a tripod. When using a tripod, you automatically take more time to compose and check scenes before recording them.

RECORDING FROM A MOVING VEHICLE

Sometimes you may have to record from a moving vehicle, such as a truck or a boat. For this type of assignment, the problem of holding the camera steady becomes even more difficult. In this situation you should handhold the camera, because a tripod transmits vibrations and movements from the vehicle to the camera. Keep your weight on the balls of your feet, and keep your knees flexed so you can sway and bend as the vehicle rolls, pitches, or bounces. Watch the horizon in the viewfinder. A tilted or wobbly horizon is very detracting when being viewed. When shooting from moving vehicles you should use a short focal-length lens and a fast shutter speed.

CAUTION

When shooting from a moving vehicle, you must follow all safety precautions. Use common sense, you do not want to jeopardize yourself or the video equipment.

PANNING

One of the most commonly abused motion-media techniques is panning. Panning is moving the camera from left to right or right to left. Moving it up or down is called tilting.

Only a few subjects require panning while you are actually taping. The use of panning can keep a moving procession, such as a marching unit in view, show a sweep of landscape, or show the relationship between objects or subjects.

There are definite and clear-cut rules and methods for panning. The very first is PAN ONLY WHEN PANNING IS NECESSARY. Panning a camera without a valid reason produces images that only irritate the viewer.

Making Pans

Making professional-quality pans takes practice and experience; however, you can easily gain this skill. One of the first and most important points to remember is to pan slowly and smoothly. Panning appears faster on the screen than it actually is; therefore, camera pans must be slow and consistent while maintaining a smooth, steady panning motion. When panning a moving object, you must keep pace with the object and allow for subject lead room. Panning too fast may make the viewer dizzy; therefore, it is advisable not to position the camera too close to the subject. The farther the subject is from the camera, the slower the pan required to follow the subject at a given speed.

Throughout the entire pan, the camera must be level without up and down wobbling. Whenever possible, rehearse the pan before you actually shoot. Know exactly where and when you want to start and end the pan. Practice the pan several times without recording on tape. Make the pan shot only after you can do it smoothly and accurately. The smoothest and best pans are made with the use of a tripod or other suitable camera support. Good handheld pans are always difficult to achieve.

Before you pan with a tripod, be sure the camera is absolutely level. Check the camera for level throughout the entire arc of the pan with a spirit bubble level located on top of the tripod head.

To produce better pan shots, position yourself comfortably for the end of the pan. Then, keeping your feet in this position, “wind” yourself around to the start pan position. As the pan progresses, "unwind" into the most comfortable position for a smooth stop. When using a tripod, be careful not to bump into the tripod as you are shooting.

Tilting the Camera

Moving a camera up and down vertically is called tilting. Tilting is useful when you want to photograph tall structures in one shot or to follow action, such as a parachute jumper.

Most of the rules that apply to horizontal panning apply equally well to tilting. As with horizontal panning, tilting should be used only when stationary shots cannot accomplish the desired effect.

A tilt should be made slowly and smoothly. Know where and when you want to start and end the tilt. Usually, you start and end a tilt with a stationary shot.

To photograph a tall building or object, you should normally start the tilt at the bottom and move up. This is the way people naturally look at tall objects. There may be times, however, when you may start a tilt at the top and move down; for example, you might show flames coming out from the top-floor windows of a skyscraper, then tilt down to show the fire trucks arriving. When you are following action with a tilt, the type of action determines the direction of tilt. Also, as with a horizontal pan, you should show enough of the surrounding area so the audience can associate the subject with its location.

SHOT VARIETY

One of the great advantages of motion media is that it involves the viewers in the action. Viewers feel that they are there and participating in whatever is happening on the screen. They can be made to feel that they are moving along with the action as it develops, they become even more involved. Changes in the camera angle permit the viewers to see the same subject from several different positions, as though they were moving within the scene. This adds variety and makes the images they see more interesting because something is a little different about each one. However, be careful to keep these camera-angle changes from confusing the viewers. If the changes are so different that they seem to be in other locations, the viewers lose their orientation. When choosing the camera angle, be sure you present the subject from the best possible vantage point and create the proper psychological effect.

MOVEMENT

When you can control the angle at which the action passes across the camera lens axis, your shots will show the apparent speeding up or slowing down action. Objects moving at right angles to the lens (across the lens axis) appear to be moving faster than objects approaching the lens directly or going straight away from it. You can vary the apparent speed of objects by selecting various camera angles.

Good motion-media footage needs movement. Movement can take place in front of the camera, of the camera itself, and of course in the picture itself. The movements necessary for good motion video are divided into three categories:

- Primary movement (movement of the subject)
- Secondary movement (movement of the camera)
- Tertiary movement (movement produced by successive shots from different cameras)

Primary Movement

Movement in front of the camera, usually that of the subject, is called primary movement. Primary movement toward or away from the camera is stronger than lateral movement. More emphasis is created by having the subject move toward or away from the camera. Exits and entrances are more impressive when they occur toward or away from the camera. Lateral movement of a subject should always be lead with the camera The viewer wants to know where the subject is going, not where it has been.

Secondary Movement

Secondary or camera movement is normally done in television studios. Secondary movements include: pans, tilts, dollys, zooms, trucks, and pedestal movements. Secondary movements are used to follow primary movement, to change or adjust picture composition, or to emphasize or dramatize something. Secondary movements must have a valid purpose. Do not make them just for something to do.

DOLLY.-A dolly is a piece of equipment that normally requires a small crew to operate. You can dolly-in to increase the size of an object gradually on the screen or dolly-out to decrease the size of the object on the screen. Likewise, dollying decreases or increases the field of view. A zoom lens can be used for the same purpose as a dolly. During a zoom, the camera does not move; therefore, perspective does not change as it does during a dolly.

TRUCK.-A truck is a piece of equipment that is basically a tripod with wheels. The camera is used to follow lateral subject movement or you could truck the camera along the objects. In either case, camera-to-subject distance does not change.

PEDESTAL.-A pedestal is used to either raise or lower the camera. Pedestalling can provide the audience with a view looking down on the subject or up at the subject. A pedestal may also be used to compensate for tall or short camerapersons or subjects.

Tertiary Movement

Tertiary movement results from a sequence of shots from two or more cameras. When two or more cameras are used, you can select from a variety of pictures and determine which picture is to be recorded and when. When more than one camera is used, you can easily emphasize, de-emphasize, show action and reaction in rapid or slow succession. The effect of tertiary movement is accomplished through videotape editing.

COMPOSITION

Video images, like still photographs, are subject to the aesthetic rules of picture composition. There are, however, factors peculiar to video that more or less influence television composition. These factors are as follows:

- The small monitor requires objects to be shown relatively large so they can be seen clearly on a small screen. You must shoot more extreme close-ups (ECU), close-ups (CU), medium shots (MS), few long shots (LS), and very few extreme long shots (ELS).
- The 3:4 aspect ratio of the picture cannot be changed so all picture elements must be composed to fit it. The aspect ratio is the ratio of picture height to width. There is no vertical format in television. You must always think horizontal format.
- The video camera is the eyes of the viewer. Therefore, camera movement, as well as the static arrangement of elements within the frame, must be considered.
- When shooting uncontrolled action, you may not be able to predetermine composition. Sometimes all you can do is correct certain compositional errors.

In motion media, the picture on the screen is referred to as a shot. A shot is one continuous camera run from the time the recording starts to the time the recording stops. A shot may last a few seconds, several minutes, or the entire program. A motion-video cameraperson must always think in terms of shots.

Most rules of composition in still photography apply equally well to composition in motion media. Composition was covered earlier in chapter 5. The

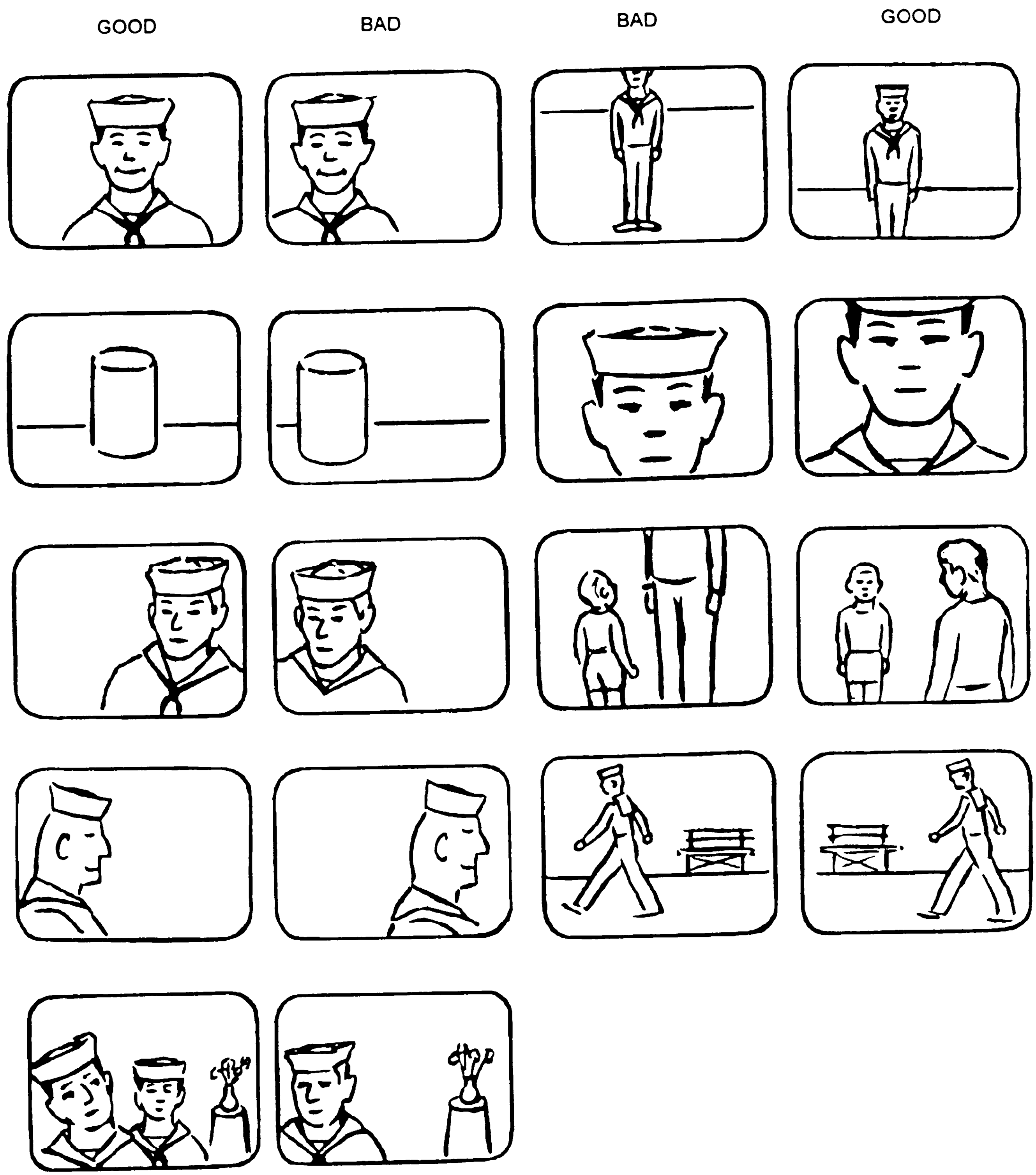

Figure 13-9.–TV framing.

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Figure 13-10.–Long shot, medium shot, and closeup shot progression.

simple line drawing examples of TV framing (fig. 13-9) indicates how to stage and show elements within the confines of the small 3:4 fixed aspect ratio of a television picture.

Use high- and low-camera angles with caution. High angles tend to shorten the legs of a person. Low angles may distort the body and face of the subject. Of course, watch for objects that seem to be growing out of or are balanced on a person's head.

Area of Talent Included

Most motion-media assignments involve people. You may find it convenient to identify people shots by the section of the body that is included in the frame. The person's head is usually in the top of the picture; therefore, shots vary according to the lowest part of the talent shown at the bottom of the screen. Thus the terms used to describe various people shots are as follows: full figure shot, knee shot, thigh shot, waist shot, bust shot, head shot, tight head shot.

Number of People Included

The shot designations that are easiest to remember are the ones that refer to the number of people included in the picture. When only one person is to be shot, it is a one-shot. Obviously, a shot that shows two people is a two-shot, three people make a three-shot, and so on; however, when five or six people are pictured it is called a group-shot. A crowd-shot is when a large group of 20 or more people is being framed.

BASIC SEQUENCE

During motion-media recording, you can change the image size by changing the camera-to-subject distance or by using a zoom lens (which also changes the field of view).

When recording an event on motion media, there are three basic shots or sequences you must use: long shots (LS), medium shots (MS), and closeup shots (CU) (fig. 13-10). The type of shot being used can limit or increase the amount of visual information presented to the viewer. Long shots generally establish a location. A medium shot is used primarily as a transition between a long shot and closeup shot. Closeup shots create impact and provide more detail and less visual information pertaining to the subject's surroundings.

Shot classifications can be broken down into five categories: extreme long shots, long shots, medium shots, closeup shots, and extreme closeup shots.

Extreme Long Shots

An extreme long shot (ELS) is used to portray a vast area from an apparently very long distance. An ELS is used to impress the viewer with the immense scope of the setting or scene. An ELS is best usually when made with a stationary camera. Camera panning for an ELS should be avoided unless panning is needed to show more of the setting or to help increase audience interest in the film. An extreme long shot can be used to give the audience an overall view of the setting before the main action is introduced The use of an ELS is an effective way to capture audience interest from the start. Extreme long shots should normally be taken from a high vantage point, such as from a tall building, a hilltop, or an aircraft. Extreme long shots are used primarily in films and are seldom used in video productions.

Long Shots

A long shot (LS) shows the entire scene area where the action is to take place. The setting, the actors, and the props are shown with an LS to acquaint the audience with their overall appearance and location within the scene. An LS is used to establish all elements within the scene so the audience knows who and what is involved and where they are located An LS, therefore, tells where. It establishes where the action is taking place.

The subject's entrances, exits, and movements within a scene should normally be shown with an LS when their locations in the scene are significant. Following actors from location to location within a scene area with closeup shots confuses the viewer about the location of the subject within the scene.

The composition for an LS is usually 'loose," giving room for the subject to move about. While this may make identification of actors somewhat difficult, an LS is usually short and the subjects will be identifiable in closer shots.

Medium Shots

A medium shot (MS) is usually used between a long shot and a closeup shot. After the scene location has been established with an LS, the camera is moved closer to the main subject or a longer focal-length lens is used to bring the main element of the scene into full frame or near full-frame size. A medium shot tends to narrow the center of interest for the audience and answers the question **"what."**

In an MS, actors are usually photographed to show them from the waist up. An MS is normally sufficient to show clearly the facial expressions, gestures, or movements of a single actor or a small group of actors.

With an MS, movement of the subject can be followed with a pan or other camera movement while still showing enough of the surroundings so the audience does not become disoriented. Motion-media coverage should normally progress from a long shot, to a medium shot, to a close-up, then back to a medium shot. This reestablishes the scene location or the actors within the scene.

Closeup Shots

The closeup shot (CU) fills a frame with the most important part of a scene. The CU should include only action of primary interest The portion selected of an overall scene, such as a face, a small object, or a small part of the action, may be filmed with a closeup shot. Close-ups give the audience a detailed view of the most important part or action within a scene. Close-ups also help to build audience interest in the film. The CU shot can be used to "move" the audience into the scene, eliminate nonessentials, or isolate a significant incident.

As a motion-media cameraperson, one of the strongest storytelling devices you have are close-ups. Closeup shots should be reserved for important parts of the story so they deliver impact to the audience.

Extreme Closeup Shots

Very small objects or areas or small portions of large objects can be photographed with an extreme closeup shot (ECU), so their images are magnified on the screen. Small machine parts, such as calibrations on a ruler or a match at the end of a cigarette, can be very effective when shown on a full screen in an ECU.

Do not forget, you must change camera angles between shots within a shot sequence.

CONTINUITY

Motion media should present an event in a continuous, smooth, logical and coherent manner. When this goal is reached, the film has good continuity. Continuity plays a major role in the success or failure of a project. Without good continuity, a motion video would be nothing more than a jumbled mass of unrelated still-pictures. On the other hand, good continuity in a film encourages the audience to become absorbed in the film. Continuity then is the smooth flow of action or events from one shot or sequence to the next. Continuity is the correlation of details such as props, lighting, sound level, image placement, and direction of movement across the screen between successive shots of the same piece of action.

The shooting of all motion media should be based on a shooting plan. This plan may be as simple as a few scribbled notes, or it can be an elaborate script. The better the shooting plan, the better your chances of success in achieving good continuity. Another way you can learn to create good continuity is to watch and analyze "Hollywood" movies. The next time you see a Hollywood production, notice how the action flows smoothly from shot to shot and from scene to scene. Try to visualize the techniques and camera angles that were used. Then, on your next assignment, plan them first, then use some of these professional techniques to achieve good continuity.

The first step toward good continuity in your films is the planning beforehand. You should plan your continuity and put your ideas on paper. Do not get the idea that all your shots have to follow a written script. News events, and other uncontrolled action, are usually shot without a script; nevertheless, you should be able to anticipate action and prepare a mental script. The information you must know before starting to shoot is what scenes and actions are needed to satisfy the requestor.

SCREEN DIRECTION

In motion-media photography, the direction a person or object either looks or moves can cause continuity problems. The direction a person or object looks or moves is called screen direction. When a look or move in a particular direction is unaccountably changed from one shot or scene to another, the continuity of the film is disrupted. Any change in screen direction must be explained or the subject may suddenly change screen direction and appear to be going the wrong way.

How the camera "sees" the action-not how the action actually appears-is important. In other words, the audience judges the action by its screen appearance, not by the way it actually appeared during filming.

There are four types of screen direction. They are as follows: neutral, constant, contrasting, and static.

Neutral Screen Direction

Neutral screen direction movement shows subjects moving toward or away from the camera. Because neutral screen direction movement is nondirectional, it may be used or intercut with scenes that show movement in either right or left directions. The following are neutral screen direction movements.

- Head-on and tail-away shots show the subject moving directly toward or away from the camera. For an absolutely neutral shot, only the front or back of the subject should be shown. When one side of the subject is shown, the shot will show some direction and not be absolutely neutral. Entrance and exit shots also show direction and therefore are not neutral.

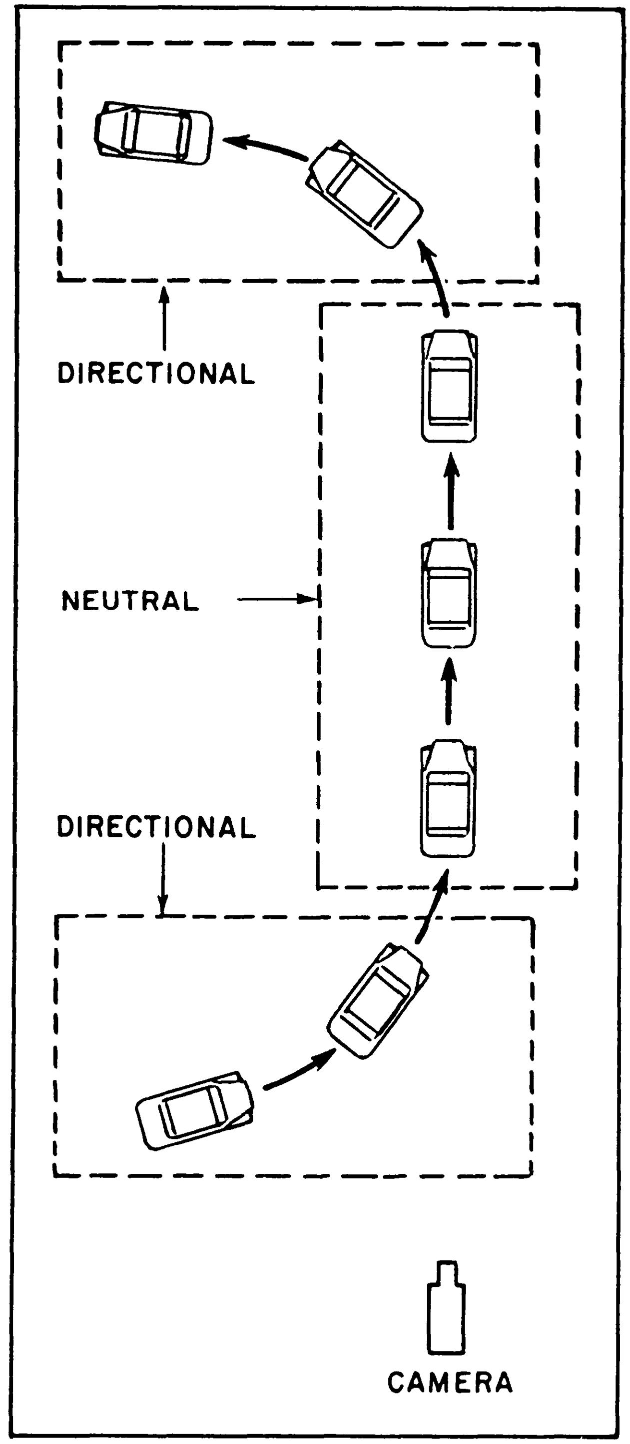

Figure 13-11.–Showing a change in screen direction.

A shot can start as a neutral shot and transition into a directional shot, or vice versa; for example, start with a head-on shot of a car and continue filming as the car turns to the right and exits the frame, or start with a direction showing a shot of the car entering the frame from the left, and continue filming as the car turns left to a tail-away neutral shot (fig. 13-11). These types of

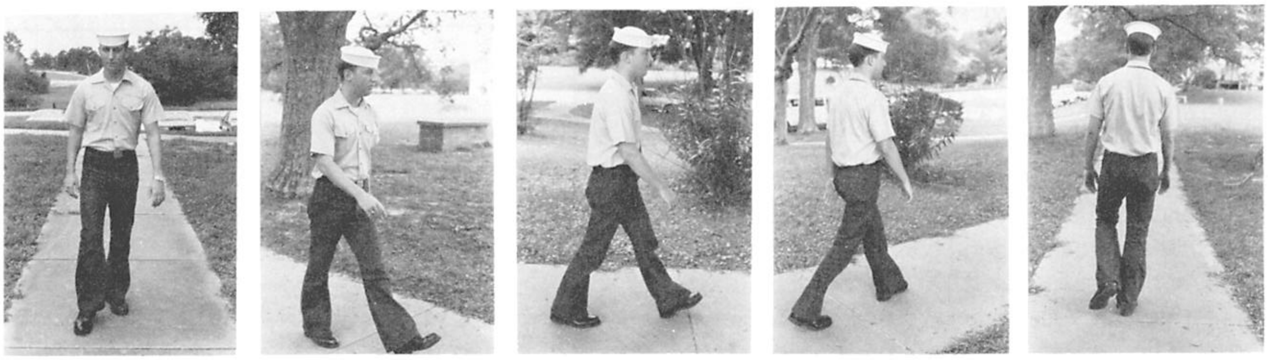

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Figure 13-12.–Showing change of screen direction.

shots can be used to change screen direction by temporarily showing a neutral condition between two shots when the subject moves in opposite directions.

- Tracking shots are accomplished by moving the camera directly ahead or behind the subject, either leading or following the subject, respectively.

As with head-on or tail-away shots, tracking shots are neutral only when the subject is not shown entering or leaving the frame and when only the front or back of the subject is shown.

- High-or-low camera angle shots-The subject moves directly toward and under or over the camera so, the subject exits at either the bottom or the top of the frame. Examples: a train, shot from a high-camera angle, may move directly under the camera and exit at the bottom of the frame, or an aircraft may take off and move over a low-angled camera and exit at the top of the frame.

- Subjects traveling abreast shots-Two or more subjects move directly toward the camera and split up to exit the frame on both sides of the camera, or enter the frame on both sides of the camera and join up, moving directly away from the camera.

A neutral shot inserted between two shots of a subject moving in opposite cross-screen directions distracts the audience momentarily to allow for the change in direction.

To open a sequence, you can use a head-on shot to bring a moving subject from a distant point toward the audience. To close a sequence, you can use a tail-away shot of a subject moving away from the camera. Shots, such as these, present moving images that increase or decrease in size and have more of an effect on apparent depth than do cross-screen movements.

Head-on and tail-away tracking shots add variety by offering a change from the usual three-quarter side shots. Head-on shots tend to produce greater audience impact because the audience is "placed" dead center with the action advancing toward them.

Constant Screen Direction

Constant screen direction shows subjects moving in one direction only. When one subject moves in the same direction through a series of shots, progression is represented.

Once screen direction has been established, it should be maintained until a change in direction can be explained. When a shot suddenly shows a subject traveling in the opposite direction to the previous shot, the audience will get the impression that the subject has turned around and is heading back to the starting point. Any change in screen direction must be explained.

One way to change screen direction (for example, a head-on to a tail-away) and explain the change to the viewers is to film the subject in the following sequence. First, record a head-on shot. Secondly, cut the shot to a three-quarter angle of the subject moving left to right. Next, cut the three-quarter angle to a view of the subject crossing the screen, then to a rear three-quarter angle of the subject. Finally, cut from the rear three-quarter angle to a tail-away shot (fig. 13-12).

A way to maintain constant screen direction is to use the action-axis technique. An action axis is nothing more than an imaginary line created by subject movement.

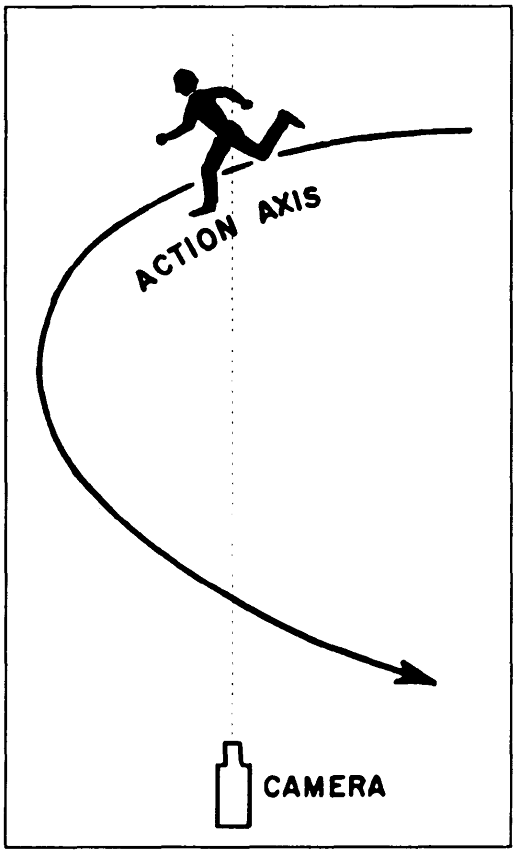

Figure 13-13.–Subject crossing the action axis.

When the camera is positioned on the same side of the action axis each time it is moved for a series of shots, the screen direction remains the same throughout the series. The relationship between the camera and subject movement or action axis remains the same if the camera does not cross the action axis. Once established, screen direction can be maintained by keeping the camera on the same side of the action axis.

When constant screen direction cannot be maintained, any change in direction MUST be visually explained to the audience. Constant screen direction changes can be explained in the following ways:

- Show the moving subject actually changing direction. This is the most effective way to change screen direction because the audience sees the subject change direction and there is no doubt in their minds how it took place.

- Film the moving subject crossing the action axis on a corner or curve. This permits the subject to exit the frame on the "wrong side," thus changing screen direction (fig. 13-13).

- Use a reaction closeup shot of an observer viewing the movement in the new direction. A reaction close-up serves as a neutral shot and distracts the audience, so the change in screen direction can take place. A reaction close-up, in this situation, could be a close-up of an observer's head turning to follow the movement of the previous scene. The head of the observer should turn as though the action is taking place behind the camera, thus putting the camera between the action and the observer.

Contrasting Screen Direction

Contrasting screen direction is used to show subject movement in opposite directions. This can be shown by a subject moving toward a distant destination and then returning to the starting place. An example would be a sailor who leaves the ship and walks in a left to right screen direction to town. Therefore, the ship-to-town direction is established as left to right. Movement of the sailor to the right is toward the town and movement to the left is toward the ship. The viewer will associate the sailor's walking in a right to left screen direction as returning to the ship. Once the direction of travel is established, you must maintain it.

Contrasting screen direction is also used to show opposing subjects moving toward each other. An example would be two warships that are headed into battle. The first ship is shown steaming from left to right, and the second ship is shown steaming from right to left. This pattern gives viewers the impression that the ships are closing the distance between them and will soon meet.

Static Screen Direction

Static screen direction refers to the direction that subjects look or face. Screen direction must be established and maintained even when the subject does not move about within the scene. The direction in which the subject looks should match throughout a series of consecutive shots. The direction the subject faces can be different from the direction that the subject looks; therefore, the static screen direction is the direction in which the subject is looking. To maintain static screen

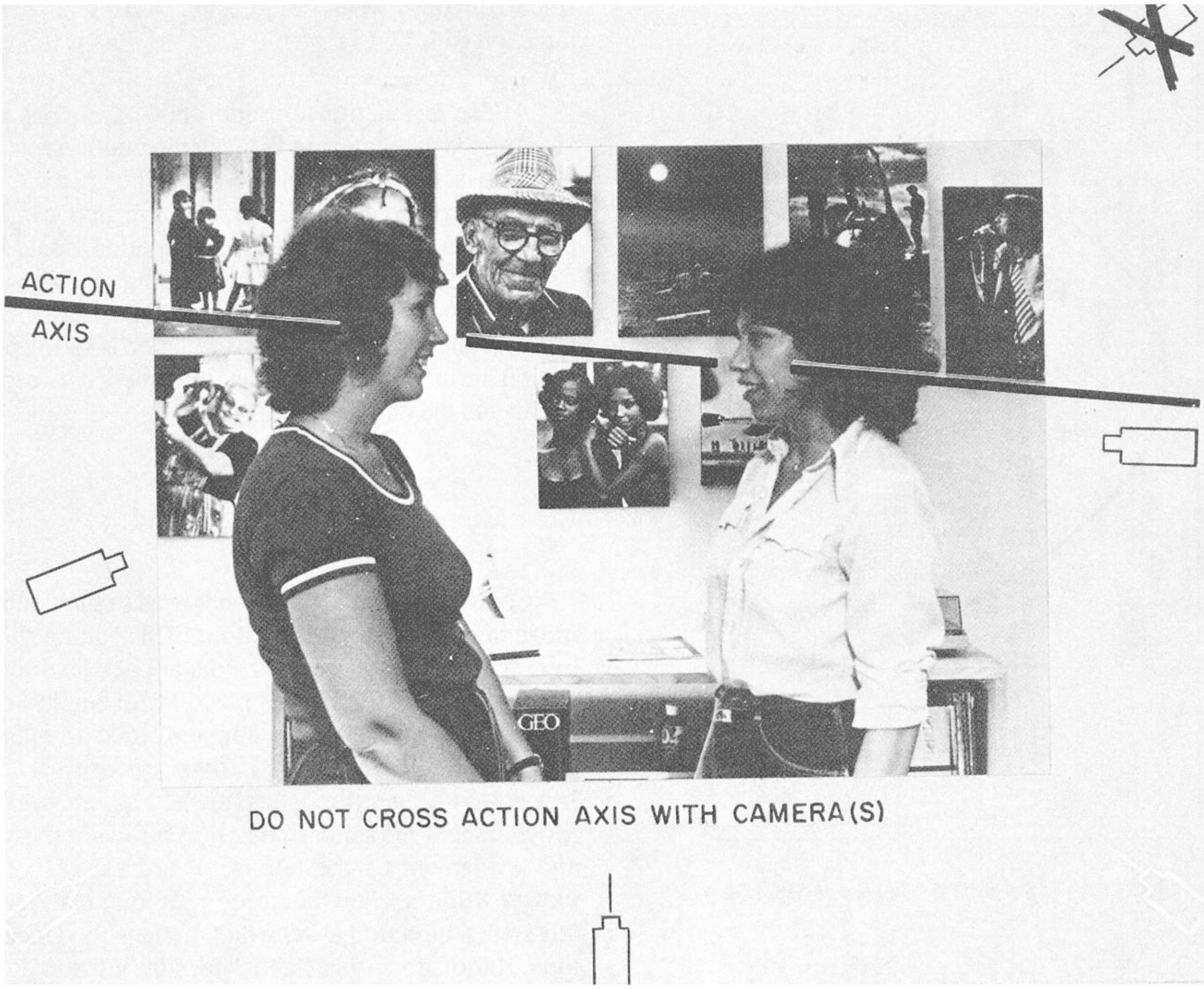

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Figure 13-14.–To maintain static screen direction, do not cross the action axis with a camera.

direction, the camera operator must remain on one side of the action axis (fig. 13-14).

CUT-IN AND CUTAWAY SHOTS

In filming uncontrolled action, it is almost impossible at times to film overlapping action. This is where cut shots come into play. Cut shots are extremely valuable because they provide a form of audience distraction In addition, the cutaway can account for lapses of time and stimulate audience interest; therefore, if you shoot plenty of cutaways and cut-ins, you have passed a major stumbling block in shooting uncontrolled action. Shooting a football game is a good example of uncontrolled action; but can you imagine how boring it would be if there were no cutaways or cut-ins? An audience would soon get tired of seeing nothing but football plays. By using different scenes, you can show just the highlights of the game and the audience will go away satisfied, feeling that they have seen the entire game.

Cut-ins and cutaways are related to the primary subject or action. They show something that may or may not have occurred simultaneously with the primary action. Both cut-ins and cutaways fill gaps between scenes where the action does not match. The use of cut-ins and cutaways can account for a lapse of time or they are used to create or enhance the mood of a film.

Cutaway shots are scenes that "cut" away from the action. Crowds, cheering fans, cheerleaders, and side-line action are all examples of cutaway shots. Ideally, cutaways should smooth out the continuity of the film, so the audience does not realize that some of the action that took place on the field has been removed from the film.

A cutaway also can be used when you want to condense an extended flow of action; for example, if you start a sequence with a closeup shot of the time clock indicating 12 minutes left in the quarter, then cut to the primary action on the field for about 10 seconds, then cut back to the clock indicating 3 minutes left-the elapsed time of 9 minutes would be indicated to the audience.

An example of a cut-in is a close-up of one player's foot as he kicks the ball. This close-up could have been shot at any time; however, by inserting the cut-in into the film during editing, the audience feels that the kick actually happened during the game.

The difference between a cut-in and a cutaway is simple. When filming the football game, the camera operator "went in" and took a close-up of the kicker's foot as he kicked the ball. The operator of the camera cut-in to the action. However, when the camera operator shoots a close-up of a fan's foot kicking another fan who had been rooting for the wrong team, that is a cutaway, because it cut away from the primary action of the game. Cutaway shots represent secondary action. Cut-in shots represent primary action.

CONTROLLED ACTION

As the name implies, in controlled action you can control all aspects of a production. This includes actors, their actions, the set lighting, and sound recording, if any. You usually work from a well-developed script that includes all the details. If the actors speak, the dialogue is in the script. If the action is described by a narrator, the narration is in the script. If the film is silent, the titles appear in the script. Examples of controlled-action films include training films, some documentaries and historical records, and many publicity or recruiting films. Controlled action, motion-media productions are produced only by personnel with specialized "C" school or university training. As a nonspecialized Photographer's Mate, you will be faced with uncontrolled or semicontrolled action elements of a production or film.

UNCONTROLLED ACTION

In a controlled-action situation, everything is normally written in the form of a detailed shooting script. Predictable filming is performed and there are few crises, except the occasional human oversights and mechanical malfunctions.

The other world of motion-video recording (uncontrolled action) is full of crises and surprises. Success primarily is due to good reflexes, accurate guesswork, and quick thinking. Careful planning is not the most significant factor. Most of your motion-media assignments will be uncontrolled or semicontrolled action.

Your success as a maker of uncontrolled-action films depends on your knowledge of the capabilities and operation of video equipment. You must also possess a high level of technical skill. There is neither time nor opportunity for research or practice while doing this kind of assignment. You must be prepared in advance. News, sports, special events, and on site-coverage of ongoing activities make up the bulk of this type of assignment. Another class of uncontrolled action is the documentation of events that follow a known course or pattern, such as parades and ceremonies. These are called semicontrolled, because you know in advance approximately what is going to happen, even though you cannot influence it for recording purposes. Both types of assignments are challenging, exciting, and usually welcomed by confident camerapersons. But, they can be "unfortunate experiences" for those not properly prepared to cope with them.

PREPARATION FOR FILMING UNCONTROLLED AND SEMICONTROLLED ACTIONS

Obviously you cannot develop a specific, detailed plan for shooting uncontrolled or semicontrolled action. You must get as much information about the assignment as possible and in as far in advance as possible. This information helps to provide an estimate of requirements for equipment, supplies, scheduling of personnel, transportation, camera positions, lighting, and other technical details.

Whenever you are assigned to cover VIP arrivals, award presentations, or special events, you should immediately contact the person or agency in charge of the project. This person is usually the public affairs officer (PAO). The PAO can furnish you the full scope of your assignment and provide the following basic information:

- Name and rank or title of the person(s) involved
- Place and time of arrival
- Complete schedule of activities

When possible, you should personally inspect the location and route of the proposed action (site survey). If this cannot be done, try to get drawings, maps, plans, or photographs of the area. Eyewitness descriptions or pictures of similar events also may be helpful. Ask questions about the location of the subject, the type and direction of movement, and the sequence of actions to be recorded.

With this information, you can draft a rough plan. By working closely with the project officer, you should be kept reasonably well informed and can arrange your shooting in a logical order. Be careful, however, not to "plan yourself into a trap." Expect last minute changes in your plan, and, therefore, keep alternative plans in mind and ways they can be put into effect quickly.

Next, determine shooting requirements and the number of cameras and people you need. Check probable camera locations for the long, medium, and closeup shots. Determine the amount of tape you require, and consider the possibility of some unplanned requirements. Determine whether you will need transportation and additional equipment.

A hypothetical assignment: The lab has received the following orders: "The Chief of Naval Operations and his party are expected to arrive aboard your ship tomorrow. The flag requires complete photographic coverage of all official activities of the CNO and his party while on the ship." The division chief has assigned you to cover the motion media.

After you check with the officer in charge of the event, you find that the CNO and his party are expected to arrive by aircraft at 1300 hours. The party consists of the Chief of Naval Operations and three aides. The purpose of this visit is to inspect the ship and to present several awards. The CNO and his party plan to depart at 1700 the same day.

With this information you can now plan your shooting outline. In an event of this kind, you cannot expect to stage or control many shots.

The following shooting outline is an example of what you might come up with:

Scene 1: Aircraft (A/C) with CNO landing.

Scene 2: Side boys, flag officer, and CO on deck in front of island.

Scene 3: A/C taxies to island.

Scene 4: CNO's party disembarks A/C.

Scene 5: Flag officer and CO greet CNO.

Scene 6: CNO inspects side boys.

Scene 7: LS, MS, and CU of CNO presenting awards.

Scene 8: CNO makes speech

Scene 9: CNO and party tour ship.

Scene 10: CNO and party return to A/C.

Scene 11: A/C taxies to fantail for deck launch.

Scene 12: A/C takes off.

Now, how do you get the coverage?

In scene 1, you could be in a high position for an establishing shot showing the flight deck with the A/C landing. After the A/C lands, you move down to the flight deck and shoot scene 2, MS, of the side boys, the flag officer, and the CO taking their positions on deck to greet the CNO. Scene 3 is an LS showing the A/C taxiing to the island. For scene 4, shoot an MS of the CNO and his party leaving the A/C. Scene 5 is a CU of the flag officer and CO greeting the CNO. Scene 6 starts with an LS of the CNO inspecting the side boys. Circumstances permitting, move in for an MS and CU of the inspection. Scenes 7 and 8 should be easy to shoot because of the time it takes to read citations, make awards, and give a speech. This should allow plenty of time for you to move about and get long shots, medium shots, close-ups, and cut shots. Follow your judgment and intuition for shooting scenes 9, 10, and 11. Scene 12 is your closing shot. Again, shoot from a high position to show the flight deck. Pan the A/C and follow it until it is out of sight.

The shooting outline not only serves as a "program" for planning the sequence of coverage, but it also provides a basis for determining camera placement, movement, and shot framing.

RECORDING GRAPHICS

Graphics have many applications, such as title cards, cast lists, maps, tables, charts, photographs, and inserts. Graphics should not be treated casually. Without precautions, graphics can become unsharp, confusing, tilted, distorted, and incomplete. Much of the graphics and text used in motion-video productions are created on a character generator. A character generator is an electronic device used to create words or graphics and electronically inserts them over a video picture. When a character generator is not available, graphics must be recorded by a camera

When you are shooting graphics that will be viewed on a monitor, the camera lens must be centered and parallel the graphic. The graphic and camera must be level. Your framing must be correct.

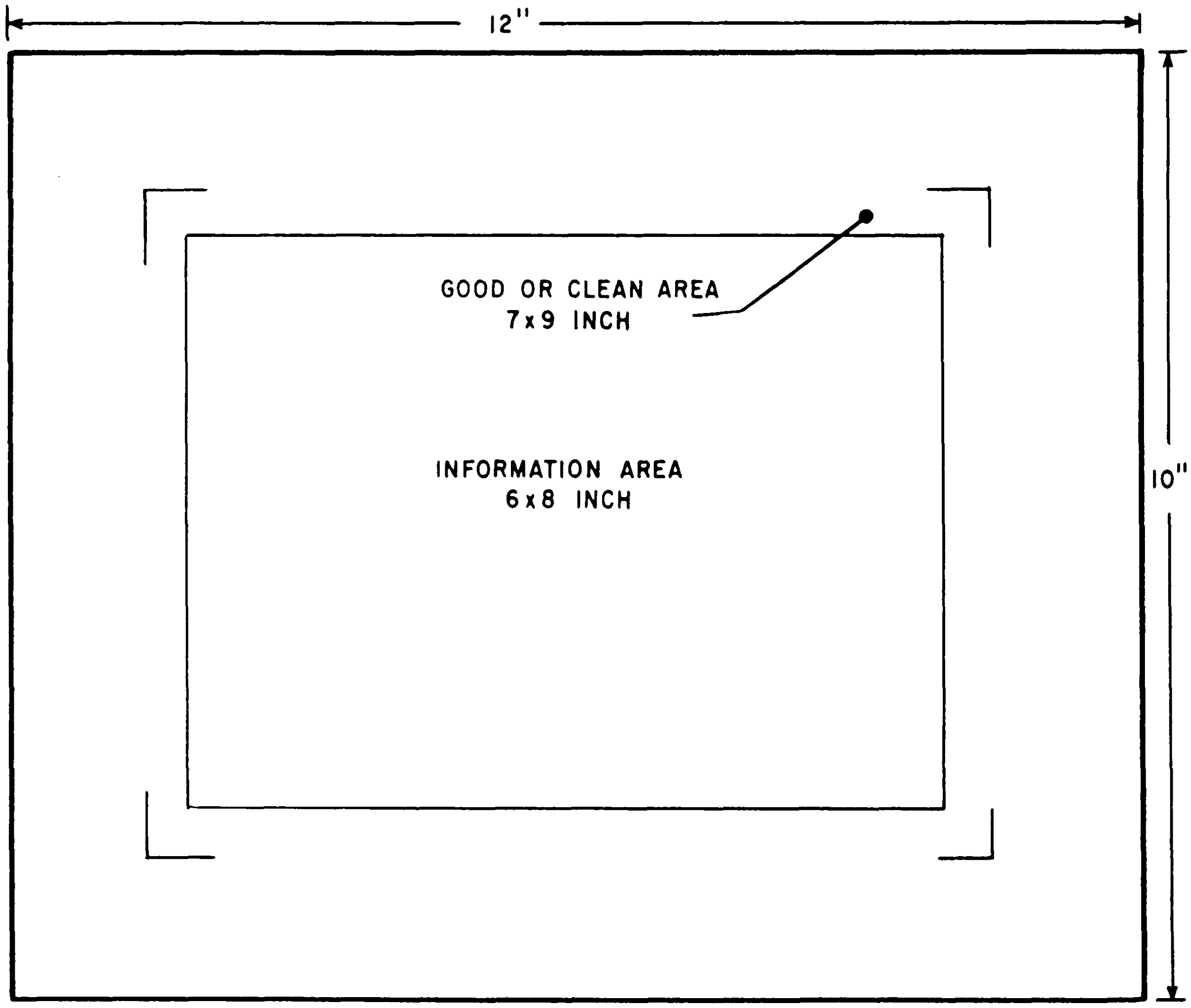

Figure 13-15.–The 3:4 ratio used for a video graphic.

Get in close enough with the video camera to show clearly all detail, but not so close that some of the information area is lost. Avoid using a wide-angle lens. Besides the possibility of camera shadows falling on the graphic, distortion is likely to occur and will be most noticeable when panning over the graphic. A longer focal-length lens overcomes the distortion problem, but is less smoothly panned.

LIGHTING

Because light reflections can obscure detail on a shiny graphic, the experienced graphic artist and photographer will avoid glossy materials and glossy photographs. However, when it is causing objectionable reflections, the graphic can sometimes be tilted slightly to help clear them; otherwise, relighting or surface dulling may become necessary. The lighting for a TV graphic is similar to lighting reflection originals in copy work. Graphics must be flat. Unmounted, warped, or curved surfaces easily show unwanted reflections.

SAFE TITLE AREA

In the production of slides for use as television graphics, important picture information must be confined within the area of the TV monitor.

Figure 13-15 is drawn in proportion to a 35mm film frame and shows the safe title area, maximum transmitted area, and film frame.

IDENTIFYING RECORDED IMAGE CONTENT

If you were notified that you won a brand new Jaguar or Lamborgini, you would probably be ecstatic. If you were presented with a truckload of unidentified, assorted parts and told that you now had everything

<table>
<tr><td colspan="3">COMMAND/UNIT</td></tr>
<tr><td>CAMERA OPERATOR</td><td>CAMERA NO.</td><td>DATE</td></tr>
<tr><td>TAPE/ROLL NO.</td><td colspan="2">SUBJECT</td></tr>
</table>

Figure 13-16.–The slate.

required to put the new car together, you probably would not be entirely grateful. Maybe you could assemble it (if you were an experienced mechanic), but you know that more information would save you time, frustration, duplication of effort, and help tremendously toward a successful outcome. On the other hand, if every part were clearly identified and the exact relationship to every other part was unmistakably described, you would certainly appreciate the gift much more. Being faced with several thousand feet of unidentified videotape is very much the same kind of situation.

The biggest problem encountered by imaging personnel in the Department of Defense during Operation Desert Storm was the lack of identification of exposed imagery. There were literally boxes of film and videotape lining the passageways in the Pentagon. Most of this imagery was of little value because it was not identified, or it was labeled inaccurately.

Accurate records are almost as important as good video coverage in achieving a professional product. Imaging products must be labeled, so the subject matter and subject location are easily identifiable on the tape. Often, there is no opportunity for personal contact between the cameraperson and editor; therefore, records identifying the filmed image content are the only information available. Logically, the better the records, the more useful the videotape. The opposite rule is also true. Inaccurate records can make the video coverage useless. Do not let that happen to your work.

SLATING

The slate you use to identify video scenes may take several forms. In emergencies you may even write scene identification on a scrap of paper and film it before shooting the scene; however, in most instances, your slate is more formal. Your regular slate is made to show whatever information is necessary. Generally, this includes the command or unit, title or subject, name of the cameraperson (identifies who is responsible for filming or videotaping the good or bad footage), date, location, and camera serial number (fig. 13-16). If you are part of a large organization that has several crews, then also include the unit number. In short, the slate should contain information needed for proper identification of each scene on your film.

The slate may actually be a piece of slate with the data written or lettered on it in white chalk. Quite often the "slate" is white with an acetate surface, and the data is written on it with a black grease pencil. When you slate a scene, hold the slate in front of the camera lens and record it for about 10 seconds for videotape or 3 feet for motion-picture film.

Of the information you place on your slate should be clearly printed in large, block letters. Film your slate so it fills the complete frame. If your slate is not full frame, the lettering may be too small to read when the tape is viewed.

VIDEO/FILM DATA SHEET		
TAPE/ROLL NO.		DATE:
SUBJECT:		
CAMERA OPERATOR		
COUNTER	SHOT	SUBJECT DESCRIPTION

NTTC DET 1540/13 (Rev. 4-91)

Figure 13-17.–Video/Film Data Sheet.

If you do not have time to film the slate at the beginning of the scene, do it at the end of the scene. This is known as tail slating. Record the slate upside down, then rotate it right side up when tail slating. This shows that a tail slate was used; otherwise, the viewer might assume that it is associated with the scene following it on the tape. When recording without a script, you have no scene numbers to slate for each scene; therefore, for identification purposes, you slate only at the beginning of each tape. If for some reason you cannot slate at the beginning, tail slating applies.

Although you, the camera operator, do not derive any particular value from the slate, the person editing your film becomes frustrated, if not completely lost, when slates are not included. This is particularly true when your scenes are not shot in the same order as the script is written. The task of locating individual shots is almost impossible unless each scene is slated when it is originally filmed. You can understand now why you must slate each scene when shooting from a script.

VIDEO/FILM DATA SHEET

Video/film data sheets are valuable to you (fig. 13-17). By looking at them you can tell the scenes that have been shot and those that still need to be done. Their main value, however, is to the editor. Without data sheets, the editor does not know the order in which the scenes were shot. Notice how the slate and data sheets work hand in hand. For a large project, the editor can check the data sheets and find a particular tape or scene easily. By screening just one videotape, the editor can spot the scene by checking the slate images. Imagine looking for a particular scene, at random, when it could be anywhere in a dozen or more tapes. Many hours are wasted when your data sheets are not properly prepared. The data sheet also may prevent accidental use of the wrong footage. If a scene was refilmed to correct an error, both the rejected and corrected versions of the same scene can be identified.

VISUAL INFORMATION CAPTION SHEETS

A Visual Information Caption Sheet, DD Form 2537, must accompany all products forwarded to a Still and Motion Media Records Center. The use of a visual information caption sheet ensures that all necessary caption information is available and standardized so it can be entered into computer data bases at the records center.

The instructions necessary to complete DD Form 2537 are printed on the back of the form. Because the completed form provides the cover story for the motion video product, it is important for you to provide accurate

VISUAL INFORMATION CAPTION SHEET

(Read instructions on reverse before completion)

1. PROJECT/EXERCISE NAME OR NUMBER	2. PROJECT/EXERCISE LOCATION	3. DATE RECORDED *(YYMMDD)*

4. CAMERAPERSON/PHOTOGRAPHER

a. NAME *(Last, First, Middle Initial)*	b. RANK	c. SERVICE NUMBER	d. ORGANIZATION

5. REQUESTING ORGANIZATION

6. MEDIA TYPE *(X all that apply)*

	a. STILL PHOTOGRAPHY		d. MOTION FILM		g. ANIMATION
	b. STILL VIDEO		e. MOTION VIDEO		h. OTHER/SPECIALIZED *(Explain in Item 19)*
	c. COMPUTER GRAPHICS		f. ARTWORK		

7. ORIGINAL MEDIA *(X all that apply)*

	a. STILL PHOTO		c. MOTION FILM
	b. STILL VIDEO		d. MOTION VIDEO

8. FILM SIZE

9. FILM TYPE

10. VIDEO RECORDING MEDIA

11. VIDEO PLAYBACK FORMAT *(If not NTSC, specify)*

12. ORIGINAL SECURITY CLASSIFICATION

13. IMAGERY RECORD SENT

a. NATURE *(If not original, specify)*

b. IF ORIGINAL WAS NOT SENT, EXPLAIN WHY

14. VIRIN NUMBER(S) *(If not listed next to individual scene or photograph descriptions)*

15. DESCRIPTION OF PROJECT, EXERCISE, ACTIVITY OR EVENT BEING RECORDED

16. ORGANIZATIONAL UNIT SHOWN IN PROJECT, EXERCISE, ACTIVITY OR EVENT

17. MAJOR EQUIPMENT OR WEAPON SYSTEM SHOWN IN THE PROJECT, EXERCISE, ACTIVITY OR EVENT

18. NAMES OF KEY PERSONS SHOWN IN THE PROJECT, EXERCISE, ACTIVITY OR EVENT

DD Form 2537, MAR 89 S/N 0102-LF-006-9400

Figure 13-l8A.–Visual information caption sheet (front).

information and as much detail as possible about the recorded event (fig. 13-18).

VIDEOTAPE CARE

The performance of videotape is often directly related to the care and proper maintenance it has or has not received. Temperature extremes should be avoided when storing tape between recording and playback. Wide temperature variations can result in a tremendous amount of stress on the innermost tape layers caused by dimensional changes. If a tape has been in storage at sub-zero temperatures, for example, you must

19. CAPTION DESCRIPTION OF PHOTOGRAPH(S) OR SCENE(S) *(List who, what, when, where, why and how)*

20. COPYRIGHT OR OTHER RIGHTS IDENTIFICATION *(If applicable)*

INSTRUCTIONS

Items not listed are self-explanatory.

ITEM

2 Enter the location where the photographs / film / video described on this caption sheet were taken.

5 Enter the organization which requested the imagery.

6 Describe media being forwarded to VI Records Center by entering an "X" in the appropriate box or boxes. If 6.h is marked, explain in Item 19.

7 Describe medium in which imagery was originally recorded.

8 Enter specific film size, e.g. 16mm, 35mm, 4x5, etc.

9 Enter specific film type, e.g. Kodachrome 64, Ektachrome 200, Plus-X, etc.

10 Specify whether 1", 3/4", VHS, Betacam, M-II, 8mm, etc.

11 Specify if PAL, SECAM, HDTV, etc.

ITEM

13 If not original imagery, list specific type such as copy negative, duplicate negative, video dub, etc.

15 This is the cover story. Give a complete description of the project, exercise, activity, or event being recorded. Provide as much detail as possible.

16 Provide the unit designation and its home location.

17 Describe the major equipment items or weapon system shown. For example, if there is a photograph or video segment showing A-10s flying over M-1 tanks, enter "A-10 aircraft and M-1 tanks" in this item.

18 Include the full name, rank, and position of each person pictured unless all of the above information is included elsewhere on the form and it is indicated which descriptions apply to which scenes or photographs.

21. FOR USE BY RECORDS CENTER

a. RECORD ACCESSION DATE *(YYMMDD)*	b. PRESENT SECURITY CLASSIFICATION *(If different from original)*	c. FINDING AID KEYWORDS *(Using revised DAVIS Thesaurus)*

DD Form 2537 Reverse, MAR 89

U.S. Government Printing Office: 1989-704-[illegible]

Figure 13-18B.–Visual information caption sheet (back).

"condition" it to room temperature. Complete dimensional equilibrium may take as much as about 16 hours. Never use direct heat to speed up the conditioning process. High temperatures can create harmful differences in layer-to-layer tension on the reel. Never use extreme cold, such as a freezer, to cool down a hot tape. In general, recommended storage conditions for videotapes are as follows:

Relative Humidity . . . . . 50% - 60%

Temperature . . . . 60°F - 80°F

For best long-term storage, rewind video cassettes uniformly for even tension before boxing. Tapes should always be in one of two places-in the VTR or in the original box. Stand videotape boxes upright. Do not store tapes in a horizontal position. This can cause bending and distorting of reel flanges that can be a major cause of tape edge damage.

To prevent damage, you should protect videotapes by covering them when they are not in use. Keeping them in dustproof cassette containers prevents the accumulation of airborne dust on the tapes. Dust can be a prime cause of dropout. Body oils and salts from your fingertips can pick up and hold foreign particles that, when transferred to the tape, cause dropouts.